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FOUR TESTS OF BROADCAST SPRAYING IN KILLING FIRST-YEAR CHAMISE SPROUTS

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ABSTRACT: Four tests were conducted to determine the effectiveness of sprays in killing first-year chamise sprouts. One pound acid equivalent was found inadequate, 2 was borderline, and 4 was almost as effective as 8. Varying the amount of oil in the emulsion, substituting 2,4,5-T for part of the 2,4-D, and changing the size of the nozzle on the boom did not greatly affect the degree of kill obtained. Increase of volume had little effect on the kill of small sprouts. A second application was required to eliminate sprouts.

Chamise sprouts can be effectively controlled with low volume, broadcast applications of 2,4-D, research and large-scale spraying operations in central and southern California have shown. On chamise-chaparral areas or sage types converted to a grass cover to aid in controlling fire,[1] or for other reasons, we have prescribed spraying with a tractor-mounted boom, terrain permitting. We have applied 2,4-D at 4 pounds acid equivalent (a.e.) in 20 gallons of emulsion per acre with the aim of killing all sprouting plants with a single application.

To help refine this technique, we conducted a study to determine the effects of (a) using different rates of chemical and volumes of emulsion, (b) varying the amounts of diesel oil in the emulsion, (c) adding

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[1] This study was conducted as part of the FUEL-BREAK Program, a cooperative undertaking of the California Division of Forestry, Los Angeles County Fire Department, and U.S. Forest Service.

2,4,5-T to the emulsion, and (d) using different sizes of nozzles on the boom. This paper reports the results of these four tests.

PROCEDURES

The study was held near Tenaja on the Cleveland National Forest in almost pure chamise that had been burned by the Stewart Fire of December 1958. The nearly flat land was ideal for tractor operation.

Plots approximately 40 by 200 feet were established in a randomized block design with each treatment duplicated. For the 2,4,5-T phase, 2- to 3-acre areas were treated without replication.

The study consisted of the following tests:

1. Rate-volume....with 2, 4, and 8 pounds a.e. of 2,4-D in volumes of 10, 20, and 40 gallons per acre (g.p.a.).
2. Diesel oil....with 0, 5, and 20 percent oil by volume in the spray emulsion.
3. Chemical......with low volatile esters of 2,4-D alone and with a 50-50 brushkiller mixture of 2,4-D and 2,4,5-T.
4. Nozzle size...with fan-type spray nozzles having a 0.3 g.p.m. output at 40 p.s.i., and twice as many nozzles having a 0.15 g.p.m. output.

The spray emulsion was applied with a D-7 tractor outfitted with a 300-gallon, slip-on spray unit (fig. 1). Our standard application of 4 pounds, a.e., of chemical in 20 gallons of emulsion per acre was used in all tests except those on rate-volume.

The plots were treated on May 25-26, 1959. At this time chamise sprouts stood 8 to 16 inches tall, and were still growing. Brush seedlings were 1 to 4 inches tall. The plants appeared to be at a good stage of development for effective spraying.

Part of the plot area was resprayed in the spring and summer of 1960 to kill plants which had survived the initial treatment.

RESULTS

Total kill of sprouting chamise plants for each treatment, except for one plot, was between 37 and 76 percent (table 1). These percents were considerably below the 95-100 percent which we hoped to obtain with a single application. Unfavorable growing conditions in 1959 may have been the reason. Total seasonal precipitation was about 50 percent of normal. The plants grew slowly through the spring with no surge of growth typical of this time of year. Although they were of adequate size for spraying, they may not have been in the proper physiological condition for effective treatment. This possibility is suggested by the high percentage of plants which were only partly topkilled, even at high application rates that normally produce complete topkill on almost all plants.

These results support the general conclusion that we should plan on broadcast spraying for two consecutive years, until we learn to obtain consistently high kills from a single application.

RATE-VOLUME

Increasing the rate of chemicals applied gave greater plant kill for each volume. A 1-pound rate was definitely inadequate, a result supported by many previous observations. The actual increases in kill between 2-, 4-, and 8-pound per-acre rates of chemical were not great although statistically significant at the 5 percent level. The heaviest rate was not justified from this test, or from other observations. And, the 2-pound rate appeared borderline. The standard 4-pound rate (a.e.) per acre is still recommended as an economical broadcast application on chamise sprouts under most conditions.

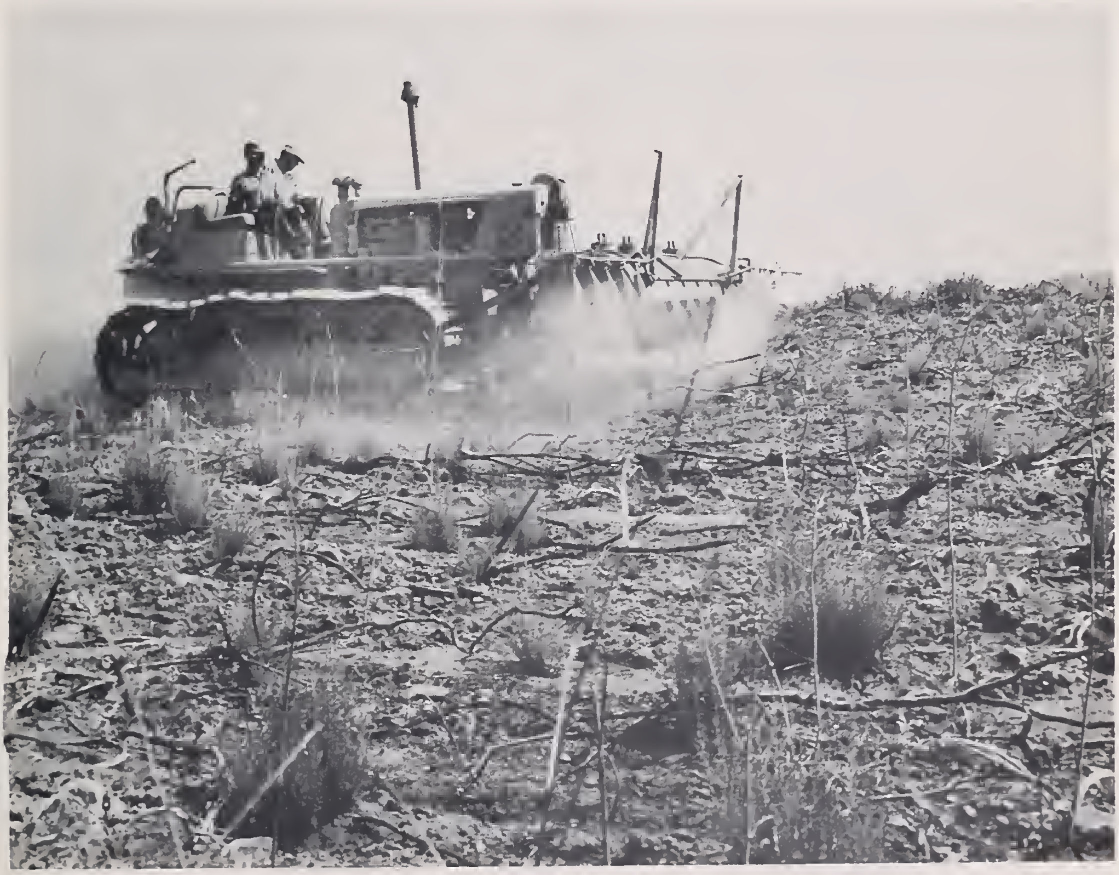

Figure 1.--A 300-gallon, slip-on spray unit powered by a D-7 tractor sprays first-year chamise sprouts.

Increasing the volume gave a little better kill at the low rate, 2 pounds a.e. per acre. But greater volume did not prove effective at 4 pounds, and it actually reduced kill at the 8-pound rate. The cause of this decrease in kill at the heavier rate was not determined. There was no significant difference in kill from either an increase in spray volume or from the interaction between rate and volume.

Use of 20 gallons of emulsion per acre with 4 pounds a.e. of chemical is recommended for tractor application, particularly for old, large plants with dense crowns not readily penetrated by spray (Plumb and Bentley, 1960). When water is scarce or difficult to supply, the high volume may add materially to spraying costs. A lower volume can be substituted.

DIESEL OIL

Diesel oil added to the spray emulsion did not increase the killing power of 2,4-D in this test. However, other experience has indicated an increase in effectiveness of 2,4-D when oil was added, especially when soil moisture was low (Leonard, 1956, 1957). Adding diesel oil at a rate of 5 percent of the total spray volume seems advisable.

CHEMICAL

The addition of 2,4,5-T to the spray emulsion did not increase total plant kill. This was shown by samples of the larger areas, on which spraying with 2,4-D gave an average total plant kill of 41 percent, and 2,4-D and 2,4,5-T produced an average of 40 percent plant kill.

Past work has indicated that 2,4-D is superior to 2,4,5-T in killing chamise under favorable spray conditions. But 2,4,5-T was more effective when spray conditions were not optimum (Leonard, 1956, 1957). However, a test in central California demonstrated that little advantage in "kill" was gained by the addition of 2,4,5-T on 2-year-old chamise sprouts (Plumb and Bentley, 1960). We recommend 2,4-D alone in a water-oil emulsion for broadcast applications in spring on 1- and 2-year-old chamise sprouts.

NOZZLE SIZE

Use of large No. 8003, or small No. 80015, spray tips gave about the same amount of plant control: 44 percent with the large and slightly better than 51 percent with the small nozzles. This study was not designed to indicate whether such a small difference in kill was caused by droplet size or by possible better coverage. However, since the smaller tips produce a higher percentage of small drops, the problem of chemical drift may be the deciding factor in selection of nozzle size. Such factors as the relationship of drop size and penetration into the plant crown and the chemical loss due to volatilization need more study. For the present we cannot recommend one nozzle size over another for broadcast spraying with a tractor boom.

RESPRAYING

Respraying a year after initial treatment killed all chamise sprouts, according to observations not yet supported by detailed sampling. The respraying was done by tractor during spring at the rate of 4 pounds a.e. of 2,4-D in 20 gallons of emulsion per acre. No appreciable kill was obtained on a second set of plots which was resprayed in August with 2 pounds of 2,4-D and 4 and 8 pounds of brushkiller per acre. This bears out previous reports that low volume broadcast applications during the summer months were not effective, probably because of low soil moisture and retarded plant growth (Leonard, 1956, 1957).

Table 1.--Average kill of first-season chamise sprouts broadcast sprayed with different rates and volumes of 2,4-D

Rate of 2,4-D per acre	Volume of emulsion per acre	Results of spraying			Total plants sampled
		Complete kill	Topkilled resprouting	Part topkilled resprouting	
Pounds a.e.	Gallons	Percent	Percent	Percent	
1	20	1	0	99	242
2	10	37	11	58	177
2	20	48	12	40	206
2	40	50	12	38	166
4	10	46	8	46	109
4	20	44	16	40	131
4	40	56	15	29	182
8	10	76	5	19	169
8	20	70	10	20	166
8	40	64	8	28	161

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